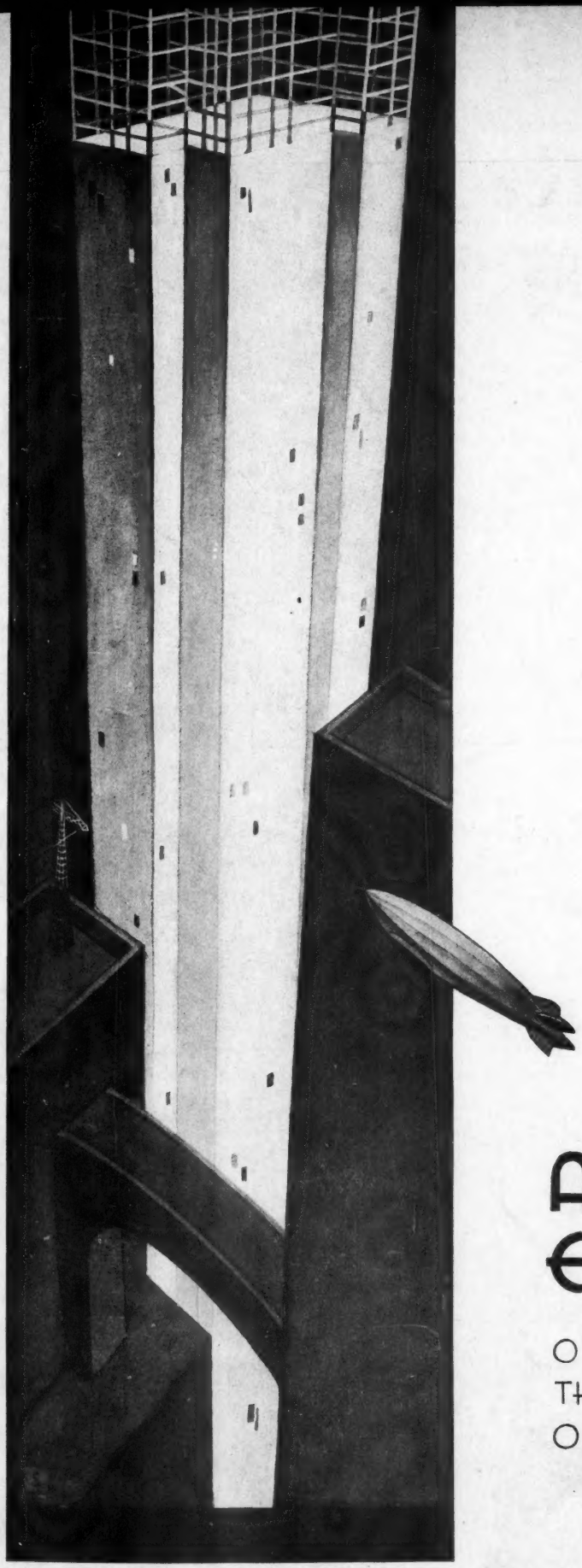

The AMERICAN ENGINEER

OFFICIAL PUBLICATION
THE NEW YORK STATE SOCIETY
OF PROFESSIONAL ENGINEERS

DECEMBER + + 1931

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Arthur V. Sheridan, Editor

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PRACTICING WITHOUT A LICENSE

The Sad Plight of One Who Did

On Saturday morning, November 28th last one, who had been adjudged by his peers, stood at the rail of justice and heard pronounced a sentence of from 7½ to 15 years, the execution of which was stayed provided the convicted man refrained from future practice of engineering. This is indeed a heavy penalty to pay for failure to appreciate the significance of illegally practicing the profession which had provided for many years the livelihood of the defendant.

On February 21st 1930, a structure collapsed, causing the death of three persons and inflicting injuries upon eleven others. The final plans for the said structure had never been approved by the authorities to whom they should have been submitted. The Grand Jury indicted the designer on two counts: one, manslaughter; and the other, practicing engineering without a license. After a trial lasting ten days the jury returned a verdict of manslaughter in the second degree. Due to the recommendation of the jury, the acquiescence of the District Attorney, the pleas of two of the grand jurors, the appeals of individuals, including several engineers, and the earnest recommendation of the New York State Society, the execution of the sentence was stayed.

While imposing sentence the judge referred to the New York State Society, and the splendid appeal of President Steinman and another, doubtless was an important factor in justifying the humane attitude of one of the fairest, most scholarly and understanding jurists it has ever been the privilege of your editor to come in contact with. To both the Judge and the District Attorney, whose counsel and co-operation have at all times been available to the local Chapter, the appreciation of the Society and the profession is due. That the Judge, the Jury, the District Attorney, and the Society most concerned with the application and enforcement of the law, should manifest the interest which proves that earthly judgment most nearly reflects divine justice when tempered with mercy is a compliment to all of them.

The conviction, however, stands as a warning that should not go unheeded. Those engineers who, through indifference or egotism, have refrained from securing their licenses may one day have cause for bitter regret. In the event of an accident or catastrophe causing death the engineer concerned is liable for manslaughter. He is in exactly the same position as the person who performed an operation in connection with which the patient died. In practicing without a license he is criminally negligent. This applies to electrical, mechanical and other specialists just as much as it does to the so-called civil engineer or to the physician.

The Engineering News-Record of December 3rd, on p. 871, under the heading, "Design Responsibility Made Real," publishes one of the finest editorials that it has been our privilege to read. The same is herewith reproduced with the permission of the News-Record:

Design Responsibility Made Real

"A precedent that may have far-reaching results was set in * * * * New York * * * * two weeks ago, when the designer of a structure whose collapse had caused loss of life was convicted of manslaughter. Such a conviction brings home the reality of design responsibility. It may be remarked that it was only the structural framework of a coal pocket that failed; but this fact makes the case the more significant. The important point is that the courts have demonstrated that existing laws lay heavy penalties upon the designer whose negligence causes loss of life. Since the conviction goes beyond any previous legal decision affecting structural failures, its connotations are of paramount importance to every engineer.

From the standpoint of the engineering profession, the conviction is eminently commendable. Sympathy for the unfortunate designer, which every engineer will have, cannot be allowed to affect thinking on the broader aspects of the case. Nor should the fact that the whole business agreement surrounding the purchase, design and con-

struction of the coal pocket was highly irregular cause the importance of the case to be minimized. The fact remains that the designer was convicted of manslaughter, and similar conviction could be had again in a like case anywhere.

The most obvious result of the conviction is that it places a curb on incompetent and chance-taking designers. The danger of loss of reputation has never affected such individuals greatly, since they have had little to lose in this respect. Fine and imprisonment, however, are something tangible. They will prove to be effective deterrents.

The case presents an excellent example of how not to engage engineering services. The owner "bought" the coal pocket from a contractor. The contractor in turn "bought" the design together with the steel from a local fabricator, who, having no design department of his own, "bought" a design from an individual who represented himself to be a competent designer, although he held no license to practice engineering. The net result was that the owner not only borrowed trouble, delay and extra expense but did not secure a good or safe design.

It is important to observe that it was not the fabricator who was held responsible for the failure of the structure, but the designer whom he had hired. This fact is of prime importance to every engineer, however competent. It demonstrates how absolutely necessary it is for the engineer, in the interest of his own security, to be clothed with authority to control every step of the design. No other person—whether he be owner, architect, foundation contractor or material dealer—should be allowed to dictate concerning any matter that concerns structural safety, for this is the major trust of the engineer. If by chance some designers have held this trust carelessly or lightly, the present manslaughter conviction should prove a powerful admonition.

That the effect of this case may not be ephemeral but lastingly beneficial, it should be utilized widely to strengthen the professional machinery that has been set up to guard the public safety. The designer of this coal pocket had no license to practice engineering * * * * Fortunately, however, the manslaughter conviction demonstrates that other existing laws are adequate to cope with culpable negligence, even though license laws may sometimes successfully be ignored.

It is plain from this case that the engineering profession is charged with insisting that its members have full control over structures which they design, to the end that the culpable negligence of other parties may not jeopardize the safety of their construction. One means to this end exists in the proposed new building code for New York City, which requires that the engineer sign an affidavit at the completion of a job attesting to the fact that the design has been executed in accordance with the plans. Other cities in revising their codes would do well to give the subject of design responsibility careful attention. For the immediate present, it is the responsibility of the whole engineering profession to give thought to ways to utilize this manslaughter conviction to best advantage for itself and for the public whose safety it is charged with guarding."

The above editorial is so much to the point that any comment would be redundant.

To every qualified practitioner in this state THE AMERICAN ENGINEER appeals. A state-wide check-up is now under way. Do not reject this plea, which is addressed particularly to mechanical and electrical engineers.

Names and locations have been purposely eliminated in the hope that no individual may be unduly and indefinitely penalized for a misfortune that might have happened to many another who has been equally culpable but more fortunate in that no untoward occurrence accorded him the spotlight.

EDITOR.

AMENDMENTS TO ENGINEERS LAW

Proposed Legislation Framed

Acting upon the request of Dr. Harlan H. Horner, Assistant Commissioner in Charge of Higher and Professional Education, that legislation, predicated upon the agreement reached by the Architects' Registration Board and the Engineers' License Board, be prepared at an early date President Steinman, after conference with representatives of various groups, forwarded for the consideration of the Engineers' Board the following amendments to Sections 1450 and 1466, respectively, of the existing law:

Sectiion 1450 – Engineers and Surveyors to be Licensed

In order to safeguard life, health and property, any person practicing or offering to practice professional engineering or land surveying in this state shall hereafter be required to submit evidence that he or she is qualified so to practice, and shall be licensed as hereinafter provided, and it shall be unlawful for any person to practice or to offer to practice professional engineering or land survey-

ing in this state; *or to assume, use, or advertise, whether with or without qualifying word, the designation engineer or engineering, surveyor or surveying, or other equivalent title or descriptive term, when such designation tends to convey the impression that such person is a professional engineer or land surveyor, unless such person has been duly licensed under the provision of this article.*

*New matter in italics.

Section 1466 – Professional Engineering

The term "professional engineer," as used in this article, shall mean a person who, by reason of his knowledge of the principles of mathematics, the physical sciences, and engineering economics, acquired by professional education and practical experience, is qualified to engage in engineering practice as hereinafter defined.

A person practices professional engineering, within the meaning and intent of this article, who holds himself out as able to perform, or who does perform, any professional service (such as consultation, investigation, evaluation, planning, design, or responsible supervision of construction or operation) in connection with any public or private utilities, structures, machines, processes, works, or projects, wherein life, health or property is concerned or involved, when such professional service requires the application of engineering principles and data.

The term "structures," when the meaning and intent of this article shall be understood to include any construction having, as essential features, foundations, walls, columns, girders, beams, trusses, arches, and slabs, any or all of these and/or other related parts, wherein the protection of life, health and property requires that types, sizes and strength of the whole or parts, and the leads, forces, pressures, stresses, and/or resistances necessary to determine the same, shall be accurately and scientifically ascertained; and shall include such structures as may be covered by the term "buildings" in any act in force in this State.

This article shall not be construed to affect or prevent the practice of architecture by a registered architect duly licensed under the laws of this state; nor apply to any building or alteration thereto costing ten thousand dollars or less.

The proposed Section 1466 is the result of much deliberation and a review of many proposed definitions of engineering. The recommendations of the joint committee sponsoring the Uniform Model Law were incorporated as far as appeared practicable and appropriate. An effort was made to define professional engineering but, as with the laws pertaining to other professions, it was found that the practice of the profession was easier to cover than the profession itself. In view of the agreement between the two Boards, appearing elsewhere in this issue, there is reason to hope for complete success in the matter of legislation relevant to the scope of engineering practice.

NOTE: Some slight revisions have been made by the Board of Licensing and the proposals forwarded to the State Education Department to be introduced and passed by it.

THE PRESENT STATUS OF ENGINEERING REGISTRATION

By PARKER H. DAGGETT

Dean, College of Engineering, Rutgers University

Ten years ago, any attempt to discuss the subject of engineering registration usually resulted in a highly heated argument. On the one side would be a group of the younger men who had not yet made their mark in the profession; on the other were ranged the patriarchs of the profession, firm in their conviction that neither the public nor the engineering profession could possibly gain through licensure of professional engineers by the State.

To many, engineering registration is still a highly controversial subject. On the other hand few engineers outside of the civil engineering branch have been touched by the question one way or the other. They have neither bothered with it nor been bothered by it since more than 90% of the registered engineers in the United States are civil engineers.

Within the last few years, however, this movement has gone forward quietly but steadily until now a majority of the states have more or less comprehensive laws governing the registration or licensing of professional engineers. One prominent engineer who has been opposed to registration now recognizes "the inevitability of it," so that in the very near future the question may well be not "What are we going to do about registration?" but "What are we going to do *with* registration?"

It is not at all in the spirit of controversy that I venture to discuss the matter, but rather to set forth the situation as it exists today, and to point out certain aspects that are of vital interest to you as engineering educators.

Wyoming seems to have been the first state to have a registration law for engineers. The law was passed in that state in 1907. Louisiana followed a year later, and by 1920 seven states had registration laws. As shown on the accompanying chart, twenty-six states, covering 55% of the area and

embracing more than 65% of the population of the United States, now have laws governing the practice of professional engineers. These states include New York, New Jersey, Pennsylvania, Virginia, West Virginia, North Carolina, South Carolina, Florida, Mississippi, Louisiana, Arkansas, Tennessee, Indiana, Illinois, Michigan, Wisconsin, Minnesota, South Dakota, Iowa, Kansas, Colorado, Wyoming, Idaho, Oregon, California and Arizona. During the past year registration laws were passed by the legislatures in Ohio and in Washington, but were vetoed by the governors of these states, in the first place because the law provided for the licensing of corporations and partnerships, and in the second because the law was too drastic.

In a few states the law covers only one branch of engineering, e. g., in Illinois, structural engineering, and in Louisiana, California and Wisconsin, civil engineering. But twenty-one out of the twenty-six states have comprehensive laws embracing all branches of professional engineering.

The number of years of professional experience required for a license varies from ten in Pennsylvania, West Virginia and Kansas, to none in Louisiana. In the latter state, however, an examination is required which could not possibly be passed by a person without a reasonable amount of professional experience. Table I shows that the majority of the states require at least six years experience.

TABLE I

State	Number of Years of Prof. Experience	Graduation From Approved School Plus Yrs. Experience
Arizona	6	2
Arkansas	4	2
California	6	2
Colorado	7	3
Florida	3	0
Idaho	6	0
Illinois	6	4
Indiana	6	2
Iowa	6	2
Kansas	10	4
Louisiana	0	0
Michigan	6	2
Minnesota	6	2
Mississippi		
New Jersey	6	4
New York	8	4
North Carolina	5	0
Oregon	6	2
Pennsylvania	10	2
South Carolina	4	0
South Dakota	6	2
Tennessee	4	0
Virginia	6	0
West Virginia	10	4
Wisconsin	7	3
Wyoming	8	4

For graduates of an approved engineering college seven states require no professional experience, ten require two years and five require four years. In a few states the law specifically recognizes engineering teaching in an approved school as equivalent to practical experience. Where the law does not specify, however, the majority of the boards have so considered it.

Practically all of the laws contain a clause under which the several boards have been obliged to register an applicant on his sworn statement that he was actually making his livelihood by practicing engineering at the time the law went into effect. These clauses usually carry the proviso that application must be made within one year from the time of the passage of the act. This provision, which has come to be known by the state boards as "the grandfather clause," has been responsible for a great deal of the unjust criticism to which some of the boards have been subjected. Under it, they have been obliged to register a number of applicants who otherwise would have been turned down. Experience has shown that the registration boards have been able, in one way or another, to eliminate many of these "grandfathers," and the situation in this respect will, of course, gradually right itself, as it did with the lawyers and physicians whose registration laws were initially handicapped by these same grandfather clauses.

One of the earliest problems which the registration boards encountered was that of reciprocity between states. In order to solve this problem, the boards in existence in 1920 organized the National Council of State Boards of Engineering Examiners consisting of one representative from each state board. The purpose of this Council, as defined in its constitution, is "to promote uniformity of practice in the administration of state registration laws for professional engineers and land surveyors, to establish and maintain a system of national qualification for registration, to provide for reciprocal relations between state boards, and to foster any movements having for their aim the promotion of the public welfare through engineering registration, and the improvement of professional standards."

This body in 1923 adopted Articles of Agreement on Reciprocal Registration under which a so-called Reciprocal Card could be issued to properly qualified registrants. This card has been recognized, by those boards which have subscribed to the Articles of Agreement, as *prima facie* evidence of qualification. The membership in this Council now comprises twenty-four of the twenty-six boards, and twenty-one boards have been issuing reciprocal cards under this plan.

At the annual meeting of the Council last month, machinery was set in motion, following the suggestion of T. Keith Legaré, Chairman of the Committee on Registration of Engineers of the American Society of Civil Engineers, by means of which there is to be established a National Bureau of Engineering Registration. The purpose of this Bureau is indicated by the following committee report which was adopted by the Council.

1. "We agree that there should be a National Bureau of Engineering Registration under the

auspices of the National Council, to function as a fact-finding and certifying body.

2. "The Bureau should be self-supporting by means of fees charged to applicants.

3. "The office of the Bureau should be in some central location.

4. "The purpose of the Bureau should be to investigate and verify the records of applicants, and to issue to those who fully comply with the standard requirements for registration adopted by the Council, a 'Certificate of Qualification' which may be used as evidence of qualification—for registration in those states agreeing to recognize said certificates, for membership in state and national engineering societies, for presentation to engineering colleges in connection with the award of professional degrees, for presentation to clients when soliciting contracts for professional services, and for presentation to employers when applying for positions.

5. "The Bureau should be administered by a Committee of the National Council, assisted by an Advisory Committee of representatives from the National Engineering Societies, all details of organization, finance, personnel, location and administration to be worked out by this committee."

This is the method by means of which reciprocal relations between the Architectural registration boards are maintained. The committee is expected to report on the plans for the Bureau at the next annual meeting of the Council which will be held in New York City next Fall.

One of the most significant events in the history of registration, and one which the writer believes will eventually be of vital interest to the engineering colleges, occurred last summer when at a conference of representatives of twenty national and state engineering organizations definite educational standards were adopted as part of the general requirements for registration in the Model Registration Law. This Model Law has been used in the past as the basis of practically all of the laws that have been passed, each state making such modifications as have been found necessary to fit local conditions.

At the present time, only one state, New York, has any educational requirements in its registration law and that only demands a high school education. As stated in the new draft of the Model Law, "minimum evidence satisfactory to the board that the applicant is qualified for registration as a professional engineer" shall be

(a) "Graduation from an approved course in engineering of four years or more in a school or college approved by the board as of satisfactory standing; and a specific record of an additional four years or more of active practice in engineering work, of a character satisfactory to the board, indicating that the applicant is competent to be placed in responsible charge of such work."

Graduation is thus placed at the head of the list of three possible methods of qualifying. Those who cannot qualify by graduation must have had eight years of acceptable experience and must pass an examination "designed to show knowledge and skill approximating that attained through graduation from an approved four-year engineering course," or must have had twelve years of lawful active practice, including five years in responsible charge, and must be not less than 35 years of age.

Regardless of the time it may take to translate these recommendations into legal requirements, it is nevertheless significant that the engineering profession has agreed to adopt educational standards on a par with those of the other learned professions.

One further point in connection with the registration laws will be of interest to you as representatives of the engineering colleges in this country. Practically all of the laws as they now exist place upon the registration board the duty of determining what is an engineering school of approved standing. At the time the Articles of Agreement were drawn up by the National Council, no attempt was made to go further than to define an approved school of engineering as one which "requires the equivalent of a high school or preparatory school diploma as an entrance requirement, and demands the equivalent of a four-year course in engineering for graduation."

For some time it has been felt that more comprehensive and discriminating standards were needed. Accordingly, at the last meeting of the Council its Committee on Accredited Schools was directed to proceed with the classification of engineering schools, according to standards to be determined in cooperation with the professional organizations concerned. This committee is now formulating its method of procedure, and will welcome advice and assistance from any source.

As I stated at the outset, this discussion has been presented not with the idea of stirring up a controversy. I am not arguing whether the registration of professional engineers by the state is right or wrong; whether it is a success or a failure; or whether it is a necessary or a wholly useless accessory of the modern state. The fact remains that engineering registration is an accomplished fact for a majority of the citizens of the United States.

The unsatisfactory status of registration is due in no small measure to the fact that the laws in many cases met such violent opposition. Many of the most bitter opponents have now become converted, however reluctantly, and are using their influence to build up rather than to tear down. In the words of the editor of one of the national engineering journals who, when asked by a disgruntled registrant if he had a license, replied, "If the editor were engaged in engineering practice he would have a license, he would deplore the present status of registration, he would conspire to elevate its public significance and professional import and hope by this route to lift engineering practice out of the trade levels and into professional respect."

ARCHITECTS AND ENGINEERS CONFER

State Boards Hold Joint Meeting

At a dinner conference, arranged by Dr. Harlan H. Horner, Assistant Commissioner for Higher and Professional Education, the Board of Registration for Architects and the Board of Licensing for Engineers, on November 24th, last, mutually agreed to respect the rights and provinces of the respective boards. The following statement issued by the State Education Department is of great importance and would seem to point the way for a complete reconciliation of the two professions.

THE UNIVERSITY OF THE STATE OF NEW YORK
The State Education Department
Office of the Assistant Commissioner of Higher and Professional Education.

Conference of the State Board of Examiners and Registration of Architects and the State Board of Licensing for Professional Engineers and Land Surveyors with the Assistant Commissioner for Higher and Professional Education, Fort Orange Club, Albany, New York, Tuesday, November 24th, 1931.

Understandings were reached at the conference unanimously as follows:

1. The examinations given for the registration of architects and for the licensing of professional engineers are set up by the two professional Boards with the authority and approval of the Education Department with complete freedom as to their nature and scope and neither Board assumes to question the authority and responsibility of the other Board in determining the form and content of its examinations. It is to be understood that neither Board countenances criticism or attempted evaluation of the examinations given by the other Board.

2. The definitions of the practice of architecture and of professional engineering are to be determined with like freedom, each profession working out a satisfactory definition with the authority and approval of the Education Department. Effort is to be made at once to set up more satisfactory definitions of practice in each profession.

3. Steps are to be taken to revise the engineering statute so far as possible so as to bring it on a parity with the statute governing architecture as regards definition, limitations and practice.

4. Neither Board offers any complaint or countenances complaint about the trespassing of one profession upon the other.

5. It is fully agreed that there is a zone in the practice of the professions of architecture and of professional engineering where the two professions overlap.

6. It is agreed that it is not possible to define such a zone by the amendment of the present statutes.

7. It is unanimously agreed finally that the consideration of controversial questions lying outside of the professional statutes should be deferred until satisfactory definitions have been worked out.

The efforts of Dr. Horner merit the commendation of both architects and engineers. If he can bring about the mutual respect and the harmony so "devoutly to be wished" he will earn and receive the gratitude of the engineering profession.

EXAMINATIONS FOR REGISTRATION OF PROFESSIONAL ENGINEERS

Recommendations Adopted October 2nd, 1931

The third and final installment of the report on Examinations adopted by the National Council of State Boards, at its annual convention in Detroit, is printed herewith.

Civil Engineering

For the specialized examination in *Civil Engineering,* the following is a list of subjects considered. It includes the subjects submitted in the questionnaire, also additional subjects suggested in the returns. The first number after each title records the number of States (out of 18) now including and favoring that subject, and the second numeral records the number of dissenting votes among the 32 Board members who responded. The Committee recommendation, to include or omit, is also appended.

Subject	Vote	Recommendation
Advanced Surveying	11-1	Include
Structural Engineering	11-0	Include
Buildings	8-1	Include
Highway Engineering	11-0	Include
Sanitary Engineering	11-0	Include
Design of Dams	11-0	Include

(Continued on Page 15)

HOW THE NEW LICENSING LAW WORKS IN NEW YORK STATE

By D. B. STEINMAN

President, New York State Society of Professional Engineers.
President, National Council of State Boards of Engineering Examiners.
Vice-Chairman, N. Y. State Board of Licensing for Professional Engineers.

All applications filed since April 23, 1931, are considered under the new law defining the educational qualifications for license to practice Professional Engineering.

Under the new law, the qualification requirements, in addition to age, citizenship and character, are as follows:

A. For engineering graduates: High school graduation, graduation from an accredited engineering school and, subsequent to graduation, four years or more of engineering experience of a grade and character satisfactory to the Board. (After 1937, engineering graduates will be required, in addition, to take the formal written examinations.)

B. For non-graduates: High school graduation, subsequent eight years or more of engineering experience of a grade and character satisfactory to the Board, and the passing of the formal written examinations.

C. Special cases: In exceptional cases, rarely invoked, the Board may waive the written examinations. such exemptions may be made only in cases of long established, recognized standing in the profession, or on reciprocity certificate of the National Council of State Boards of Engineering Examiners.

Under these improved mandatory qualification requirements, it has been easier for the Board to maintain appropriate educational standards. It has also proved easier for candidates to appraise their own qualifications before applying. The measure of what constitutes necessary preparation for professional practice has become more definite.

It is therefore interesting to make a survey of applications filed under the new law, and of their disposition. For this purpose, the writer has taken a typical batch of applications (filed 5 months after the new law became effective) and has made the following analysis of them.

This batch, collected as received by the State Education Department at Albany and then sent around among the members of the Licensing Board for individual review before a monthly meeting, contained 37 applications for Professional Engineer's license. Of these 37 applicants, 28 had college degrees as graduates of recognized engineering schools, a ratio of 76 percent of the applicants. Three of them had two degrees (A. B. in addition to subsequent engineering degrees) and one had three degrees (A. B., B. S., and E. E.), making a total of 33 degrees among the 37 applicants. Practically all of the other 9 applicants had had two or more years of attendance at schools or colleges of engineering, but had not completed the four or five years required for a degree.

Of the 28 applicants with engineering degrees, 20 met the Board's requirements for licensing. The others showed four or more years of experience, but three were rejected on account of the unsatisfactory grade or character of their experience, and 5 were advised to get further years of experience in order to satisfy the high standards of the Board.

Of the 9 applicants who were not engineering graduates, 4 with outstanding experience records were admitted to the written examinations for licensing, and the other 5 were rejected by the Board on the score of unsatisfactory or insufficient engineering experience.

The degrees represented among the 37 applicants were as follows:

C. E.	10
M. E.	2
E. E.	1
B. S. (C. E.)	7
B. S. (M. E.)	1
B. S. (E. E.)	1
B. E.	2
B. E. E.	1
B. S.	5
A. B.	3
Total	33

This constitutes an interesting cross-section of the present "run" of candidates for Engineer's licensing.

EXTRACT FROM "CIVIL ENGINEERING IN OUR COLLEGES"

PROF. L. W. CLARK

The Civil Engineering student in nearly all of our institutions receives not only instruction in the traditional Civil Engineering subjects such as bridge design, railroads, surveying, etc., but in most places he is given a very fair knowledge of such subjects as power plants, steam engineering, thermodynamics, machine design, hydraulics, electricity and hydro-electric developments. He is given a fair knowledge of chemistry and metallurgy. This broad training is indeed necessary, as the competent engineer of today must not only be a master of his own specialty, but must be able to grasp and deal intelligently with problems involving these related subjects.

One of the notable developments in the course is the general use of the laboratory, where, without attempting to make a skilled workman, the student may carry out the various tests and experiments necessary to give him an intimate knowledge of the properties of the materials with which he will have to deal.

Municipal sanitation is now accorded a prominent place in nearly all Civil Engineering courses.

Probably the most striking change in nearly all of the Civil Engineering courses of our colleges is the stress laid upon the newly established courses in business administration and economics. The benefits of such instruction cannot be overestimated, as the lack of business ability has in the past been one of the chief criticisms of the engineer. The amount of time devoted to English and history has been increased, in some cases to four years work, while public speaking has been introduced in many institutions. Specification writing and business law are two subjects which help to complete the training for the work of the practicing engineer.

What lines of work do our Civil Engineering graduates follow? In order to give a rather incomplete answer to that question I have taken from the register of the Rensselaer Polytechnic Institute the first 100 names in alphabetical order of the graduates of the last 23 years. Of these 56 are still engaged in engineering work as the term is generally used, in positions ranging all the way from draftsman to the heads of railroads and other large industrial concerns. Six are engaged in contracting work and ten in manufacturing. Fifteen have entered business, one is a teacher and twelve occupy miscellaneous positions. It is interesting to note that among the latter we find such occupations as bank cashier, fruit grower, superintendent of electric power company, lawyer, officers in the army and navy, manager of a brokerage house, life insurance agent, surgeon, etc. To offset the idea which some have that the engineer cares only for the material things of life, we find that one is a pastor of a church, while another is a Christian Science practitioner. Extremes are sometimes found also, for one is the manufacturer of Welch's Grape Juice, while another runs a little country cider mill.

I might add that the head of the Electrical Engineering Dept. at M. I. T., together with the Professor of Hydraulics, Associate Prof. of Electrical Engineering and head of the Chemistry Department at Rensselaer Polytechnic Institute hold the degree of Civil Engineer. There may be many engineers in Sing Sing Prison, but I will name only one, Mr. Wooley, whom many of you know as an honored member of this Society, and now in charge of important work at that institution.

CHAPTER ACTIVITIES

As Reported

Nassau County Chapter

The Nassau County Chapter held its annual meeting in the County Court House at Mineola on December the second. The entire staff of officers, consisting of Mr. Harold C. Stevens, President; Mr. Geo. S. Van der Werken, Vice-President; Mr. Arthur G. Archibald, Secretary and Mr. David C. Will, Treasurer, was reelected. The annual reports, which were read at the meeting, show a healthy growth in membership amounting to twenty-five percent for the year and a satisfactory condition in the treasury.

The activities of the Chapter during the past year have been largely devoted to the all-important question of water supply for the future. It was first necessary to acquaint the public and the various governing bodies of the county with the importance of preserving for its own use the supplies of water underlying its soil. This campaign bids fair to result in the inauguration of a joint survey, under federal and state auspices, of the

underground water supplies of Long Island and, eventually, of the entire state.

The intention, announced by the water supply authorities of New York City, of withdrawing large quantities of water from Nassau for use within the City aroused the membership of the Chapter and resulted in the appointment of a committee headed by Mr. Harold C. Stevens, who obtained the co-operation of the Village Officials' Association of Nassau County. In this organization the incorporated villages are represented and through such a channel it has been possible to interest state and federal authorities. It now appears likely that a thorough investigation of water resources and the future demand for water will be undertaken by these agencies. There is no doubt that with definite information available as to their extent, the resources of water can be developed and the supply allocated without hardship or unnecessary expense to any of the communities involved.

JOHN R. P. GOLLER,
Chairman, Publicity Committee.

Westchester County Chapter

Following is a copy of a letter which was forwarded by the Board of Directors of the Westchester County Chapter to the Board of Supervisors of Westchester County. The publication of this letter is made possible through the courteous co-operation of Harold W. Watt, President of the Westchester County Chapter.

"The Board of Supervisors is about to consider the report of the Budget Committee and it is reported that a decrease in the salaries of certain employees of Westchester County will be recommended.

"The county employs a great number of engineers, and a large majority of those who hold licenses to practice Professional Engineering or Land Surveying in this State, are members of the Westchester County Chapter of the New York State Society of Professional Engineers.

"At a special meeting of the Board of Directors of said chapter, held December 9th, 1931, it was unanimously decided to respectfully call your attention to certain pertinent facts in connection with the proposed salary decreases.

"While the action taken represents the opinion of the Board of Directors, nevertheless, the Board feels that it also represents the feelings of the great majority of about seven hundred licensed engineers in the county.

"You are well acquainted with the reputation which has been built up by the engineers employed by Westchester County in the conceiving, planning, designing and constructing of the county's great parks and parkway system, road system, sewer system and other engineering works. This reputation for honesty, integrity and for continually striving to develop that which will give most to the taxpayers of this county for the minimum of expenditures was not attained without great sacrifice.

"During the years of prosperity, when comparatively large salaries were being paid to competent engineers outside of the public service, those employed by our county remained loyal. During this period the engineers in the employ of the county gave unstintingly of their services, without regard to working hours or the lack of additional compensation. In so doing, they set an example of high morale and faithfulness in the performance of their duties.

"It is generally recognized that in normal times and in times of prosperity, engineers in public service do not receive the compensation which is due them and which they can command in private practice or in the industrial world. It is also an established fact that during periods of increasing wages and other incomes and increasing prices, the salaries of engineers in public service lag woefully behind. Westchester County is no exception to these rules.

"While we fully realize that the present economic situation makes an adjustment of the budget necessary we nevertheless feel, in view of the fact herein present, that this desirable result should be obtained by some other means than by reducing the salaries of county employees.

"Respectfully submitted,

"By Direction of the Board of Directors,
"W. F. WELSCH, Executive Secretary."

Queens County Chapter

The following information regarding activities projected by the Queens County Chapter has been received through the courtesy of Edgar A. McKenna, President of the Queens County Chapter:

Queens County is planning to participate in the National Bicentennial celebration of the birth of George Washington. The Queens Chamber of Commerce, through its Memorial Committee, proposes to establish 13 malls (symbolizing the 13 original states) on Queens Boulevard, one of the great thoroughfares in Queens County. On each of these malls, which are to be thirty feet in width, it is proposed (a) to set out upward of 12 American Elms which will form an archway and, (b) to erect a bronze table illustrating an outstanding event in Washington's career. One of these malls will be known as the "Mall of Engineering" and will be dedicated to the memory of the Father of his Country, with appropriate ceremonies by Queens County Chapter under the leadership of its President, Edgar A. McKenna.

It is of interest to note that the form of the memorial in its proposed expression is credited largely to George H. Bruns, a member of the Queens County Chapter.

The Queens County Planning Commission has recommended the construction of a bridge crossing the East River connecting the Counties of Queens and Bronx and it has been stated that a bill will be introduced during the next session of

the State Legislature to authorize such construction. Queens County Chapter has appointed a committee to study the project and has requested the Bronx County Chapter to appoint a similar committee so that both Chapters may co-operate in appropriate action .

The initiative is being taken by the Queens County Chapter in an endeavor to hold a joint meeting, during the early part of the coming year, of all of the Long Island Chapters (Queens, Kings, Suffolk and Nassau) at which matters of mutual interest might be considered and plans for their advancement through co-operative action discussed.

Bronx County Chapter

At the December meeting of the Chapter the facts that, following the collapse of a coal-pocket in The Bronx, an unlicensed engineer who prepared the plans for the structure was convicted of a criminal offense, and that the company which employed him escaped legal penalty, were discussed. The opinion was expressed that it should be a requirement of law that a person, before employing one professing to be an engineer, should satisfy himself by proper inquiry that the person representing himself as an engineer, and whom he considers employing, has complied with the license requirements of the law of the state, and that, should failure to make such inquiry result in the employment of an unlicensed engineer, and should such unlicensed engineer be prosecuted for any illegal act arising from such employment, then the employer should be held as a joint offender in the commission of the illegal act with which the professed engineer is charged. The matter was referred to the Executive Board of the Chapter for consideration and recommendation.

Richmond County Chapter

The following statement regarding the activities of Richmond County Chapter has been courteously submitted by its President, Frederick H. Zurmuhlen, Jr.:

Public Relations:

In the early part of 1930 the Chapter appointed a Transit Committee to study and report upon the transportation problems of Richmond County. The findings of this committee were embodied in a report entitled "Suggested Rapid Transit for Richmond Borough" which was published by the Chapter on April 10, 1931.

When the report was published by the Chapter, its worth was immediately recognized by the Civic Organizations and the Borough Administration of Richmond, and at the suggeston of the Chapter, a Transit Conference, comprising 112 civic organizations was duly organized and the President of the Richmond County Chapter, Frederick H. Zurmuhlen, Jr., was chosen as the Chairman of the Conference.

An open discussion, with the report of the Transit Committee as a basis, was carried on over a period of one year, during which time all other plans and recommendations of other bodies were analyzed by the Transit Conference. The result was the unanimous adoption by the Conference of the recommendations set forth in the Chapter report. The recommendations providing for the construction of a Rapid Transit System connecting Richmond, Kings and New York Counties and also for the construction of an Intraborough Loop in Richmond County were made the basis of a request by the Borough Administration of Richmond to the Board of Estimate and Apportionment of the City of New York which request was placed on the calendar of the Committee of the Whole of that body. It has been referred to the Board of Transportation which will make a final report on the recommendations to the Committee of the Whole at its first meeting in February, 1932.

It might be of interest to note that within a month's time, after the publication of our report, the Tompkins Bus Corp., operating buses throughout Richmond County, acted upon one of the recommendations of the Chapter, by installing a new bus route across the county along the line recommended for the Intra-Borough Loop in our report. It might also be of interest to note, that the Inter-State Bus Line which was recommended by the Chapter has, through the work of the Public Relations Committee of the Chapter, been inaugurated by the Port of New York Authority, and within two months' time, the headway between buses has been decreased from 40 to 20 minutes.

Through its activities on transportation, the Chapter has gained the confidence of the civil organizations and its Public Relations Committee is consulted on all civic projects, which in any way involve engineering problems. Also, along these lines, both officers and members of the Chapter, have been invited by civil associations to discuss engineering topics.

Unemployment:

The Chapter has established, for its unemployed members, a committee which has been able in the last six months to place three or four members in positions.

Surveying and Engineering Rates:

The Chapter has a Rate Committee, functioning at the present time, to establish a schedule of minimum charges for surveying and engineering services for Richmond County. This Committee has made the first part of its report and has submitted a schedule for minimum charges for surveys. This schedule is receiving the consideration of the Chapter and when adopted, shall be strictly adhered to by all members.

Membership:

The Membership Committee of the Chapter has carried on a continuous campaign for new members in the county. Its success is witnessed by the election of twelve new members in the past year, representing an increase in membership of 25%.

Publicity:

Through its activities in the public interest, the

Chapter, since its organization in April, 1929, has received considerable publicity in the Richmond, Manhattan and Brooklyn papers.

In column quantity, these may be listed as follows:

News columns: Richmond papers, 216 columns; Manhattan papers, 20 columns; Brooklyn papers, 34 columns.

Editorial comments: Richmond papers, 31; Manhattan papers, 3; Brooklyn papers, 7.

All of these news and editorial items were in approval of the work being done by the Chapter. In addition to these, ten editorials appeared in the public press, which had been prepared by members of the Chapter at the request of the editors of newspapers.

Grievance Committee:

The Grievance Committee has transmitted to the Secretary of the New York State Society, with supporting evidence, lists of the names of some twenty persons or companies who were misusing the term "Engineer."

Legislation:

The Chapter, through its Legislative Committee, has ardently supported all legislation proposed by the State Society and has diligently studied, and made recommendations upon all proposed legislation.

On December 10th, the Chairman of the Committee on Chapter Activities was the guest of the Richmond County Chapter. The visitor had accepted the invitation eagerly as the Richmond Chapter, although not one of the largest Chapters numerically, has long enjoyed a most enviable reputation, in the Metropolitan area, for its activities under the skillfully aggressive and progressive leadership of its President, Frederick H. Zurmuhlen, Jr., who is not only a successful Engineer but who is also a registered architect and has designed some of the finest public buildings in Richmond County.

The meeting was admirably conducted but the features which were of especial interest to the visitor were the existence of an unusually large number of committees and the quality of the reports made by the chairmen of those committees. The reports which were conspicuously notable were (a) the report submitting a schedule of minimum charges for surveys in Richmond County, and (b) the report on the establishment by the New York Port Authority of an interstate bus service between St. George in Richmond County and Elizabeth in New Jersey.

The establishment of this interstate bus line was an outstanding achievement in the interest of the people of Richmond County. It was advocated first by the Chapter in April, 1930, but it required constant pressure over a long period of time to make it a reality. Its final establishment was the result of what was practically a certificate of necessity issued by the Chapter, which was based on traffic count information gathered by members of the Chapter. And the representations made of the necessity of the service were so well substantiated during operation, that a short time after the inauguration of the service the number of buses on the line was doubled.

Richmond County Chapter deserves the reputation it enjoys. It is one of the most dependable and valuable links in the chain of Chapters which now encircles the state. May its success long endure and its reputation for service to the Profession increase.

RAPHAEL J. SMYTH,
Chairman, Committee on Chapter Activities.

NEWS ITEMS

AMERICAN SOCIETY OF CIVIL ENGINEERS

Annual Convention

The American Society of Civil Engineers will hold its 57th annual meeting in New York on the 20th, 21st and 22nd of January, 1932. At that time the results of the balloting for officers will be announced. A president, two vice-presidents, and seven directors are to be chosen.

Following is a program for the convention:

Board of Direction Meetings: January 18-19, 1932, a quarterly meeting will be held at New York, N. Y.

Annual Meetings, New York, N. Y., January 20, 21, and 22, 1932.

January 20, 1932. Morning: Annual Meeting. Conferring of Honorary Membership; Presentation of Medals and Prizes. Afternoon: Technical Meeting. Evening: President's and Honorary Members' Reception and Dinner Dance.

January 21, 1932. Morning: Technical Division Sessions. Afternoon: Technical Division Sessions. Evening: Entertainment and Smoker.

January 22, 1932. All-Day Excursion.

Members of the State Society are urged to attend.

Society Appointments

George W. Fuller of New York has been selected to represent the Society on Engineering Foundation. He fills the vacancy occasioned by the resignation of Wm. H. Burr.

Arthur W. Tuttle, Consulting Engineer of the Board of Estimate, City of New York, has been appointed Society representative on United Engineering Trustees, Inc.

Metropolitan Section

The New York Section, now known as the Metropolitan Section, has played a leading role in bringing together the local divisions of the four Founder Societies, in the formation of a special Engineers' Committee on Unemployment. This

committee is co-operating as a unit of the nation-wide Hoover Relief Program.

The generous contribution toward the legislative campaign expenditures of 1931 is elsewhere recognized in this issue.

* * *

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Convention—Jan. 25-29, 1932

The winter convention of the American Institute will be held in New York during the week of January 25th next.

In addition to the program of technical activities there will be inspection trips and numerous entertainment features. On Tuesday evening, the Edison and John Fritz Medals will be officially presented to the respective medalists.

Below is a program of the convention.

Monday morning and evening have been left open for committee meetings. Capital letters A, B, etc., denote technical sessions.

Monday, January 25:

10:00 A. M. Registration.

2:00 P. M. Opening of Convention. A—Protective Devices. B—Instruments and Measurements.

Tuesday, January 26:

10:00 A. M. C—Symposium on Distribution Circuit Lightning Protection. D—General Circuit Theory.

2:00 P. M. E—Research. F—Selected subjects.

6:00 P. M. Buffet Supper and Smoker.

Wednesday, January 27:

10:00 A. M. G—Symposium on System Stability.

1:15 A. M. Inspection Trips.

2:00 P. M. Board of Directors Meeting.

8:30 P. M. Edison Medal and John Fritz Medal Presentations.

Thursday, January 28:

10:00 A. M. H—Electrical Machinery. I—Electrochemistry and Electrometallurgy.

2:00 P. M. J—Electrical Machinery. K—Transportation.

7:30 P. M. Dinner Dance.

Friday, January 29:

10:00 A. M. L—Symposium on Time and Time Services.

2:00 P. M. M—Communication. N—Electric Welding.

All engineers are invited to attend.

Institute Amends By-Laws

Of interest to professional engineers of this state is the following addition to the by-laws of the Institute, adopted October 23rd, 1931:

Sec. —The committee on legislation affecting the engineering profession shall consist of fifteen members. It shall consider all matters relating to existing or proposed legislation which has an engineering content, and which concerns the welfare of the public or the practice of professional engineering. The committee shall also consider and report upon all other matters referred to it by the board of directors, the president, or the national secretary, and may consult legal counsel with reference to any question before it.

* * *

LICENSES RECOMMENDED

At a meeting of the Licensing Board held at Albany on November 19th, it was voted to recommend for license the following six applicants:

James M. Duffy, 33 East Post Road, Mamaroneck. P. E. and L. S.

Marvus J. Mains, 212 Hamilton Street, Rochester. L. S.

Elmer E. Palmer, 714 Everson Building, Syracuse. P. E.

Isadore Robinson, 1686 Grand Concourse, Bronx. P. E.

Albert O. Smith, Port Jefferson, N. Y. P.E., L.S.

John V. Bauer, 110-32 208th Street, Bellaire, L. I. P. E.

* * *

ANOTHER ENGINEERING ORGANIZATION

A corporation to be known as the American Federation of Engineers is in the process of formation according to information received by the Society.

Who its sponsors are, or who is identified with it, is not divulged in the announcement.

A. S. C. E. AGAIN CONTRIBUTES

Gives Generous Financial Assistance

Once again the New York State Society of Professional Enginers acknowledges the generosity of the American Society of Civil Engineers. On November 18th last, the Metropolitan Section of the A. S. C. E. authorized a contribution of $500 toward the expenses incurred by the State Society during the 1931 legislative campaign.

This is the second substantial financial contribution which has come from the oldest and most comprehensive of the National Founder Societies. The list of organizations which have approved of the legislative efforts of the Society and have rendered aid, support and financial assistance includes, the American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Association of Engineers, the Municipal Engineers of New York, the Brooklyn Engineers Club, the Assqciation of Engineers of New York, Inc., the

(Continued on Page 15)

THE SOCIETY AND THE EMERGENCY

A Suggestion for Chapter Activities

The program which New Jersey engineers, particularly the professional society of that State, have inaugurated, is worthy of emulation by the New York State Society.

While co-operating with the President's Nationwide Committee on Unemployment the engineers of New Jersey are investigating and reporting upon desirable public works which might be undertaken with a view to relieving unemployment, particularly amongst engineers.

Nowhere does there exist an engineering agency whose organization lends itself so readily to such a program as here in New York. This Society, with its Chapters in the principal counties throughout the State, occupies a strategic position in the matter of having first hand knowledge of, and the facilities for recommending, desirable local improvements.

Many Chapters have for the past two years closely identified themselves with the civic organizations of their respective counties and have prepared programs involving traffic, transportation, industrial development, water supply, city planning, and other projects essential to the expansion of the community in which they exist.

At this time, the appointment by each Chapter of special committees for the purpose of investigating and proposing public works appears in the light of preparedness for a great program, nationwide in scope, of construction. To most persons, reflection upon the nation's plight reveals but one positive means of alleviation. Charities, doles, temporary expedients and community collections offer but little hope for permanent effects. Work, involving the employment of men and the circulation of money, is the only certain means to the desired end.

A natural recovery will probably take so long as to invite tragedy and danger. Predictions to the effect that prosperity is just around the corner are childish. Emergencies require effort and planning. The present condition is an emergency. Unless a sudden unexpected change takes place drastic measures must come ere long. The New York State Society might render a valuable service by utilizing its Chapters in the making of a thorough survey of essential and useful projects. This does not mean any conflict of opinion with authorities. Consultation with them will be indispensable. The data gathered can be held as against the time when its usefulness will become apparent.

A. S. C. E. Again Contributes

(Continued from Page 14)

Albany Society of Civil Engineers and the Westchester Society of Civil Engineers.

From the latest year book of the New York Section of the A. S. C. E. one may read the following:

AMERICAN SOCIETY OF CIVIL ENGINEERS
Extract from the New York Section
Year Book, 1930-1931
Aims and Activities

The New York Section was organized in 1920. Its membership is now 1,107 out of a possible total of more than 2,600 members of the National Society resident in District No. 1, and its aims as stated in the Constitution are "the advancement of engineering knowledge and practice, the maintenance of a highly professional standard among its members and the proomtion of the general welfare of the American Society of Civil Engineering."

* * *

In this connection the Section is continuing to co-operate in the efforts being made to secure remedial legislation with respect to the Engineer License Law and the Multiple Dwelling Law.

In the face of such evidence it seems difficult to believe that any person informed of the facts or sincere in his expressions would insist upon repeating the statement that the New York State Society is not supported or approved in its legislative endeavors, by other Engineering Societies, particularly the national ones. Yet according to the Brooklyn Daily Eagle, of December 1st, an architect of this State, active and persistent in his attacks upon Engineers and upon their legislative program, made the following statement:

"The New York State Society of (Licensed) Professional Engineers, which has not received the approval of the older engineering bodies, represents a direct attack on the architects."

Such methods invariably react in a manner that discredit those who make them. Once more the New York State Society expresses its apreciation and hopes to merit the generous support received from the Metropolitan Section.

* * *

Examinations for Registration

(Continued from Page 8)

Canals	10-0	Include
Port Development	4-3	Omit
Contracts	7-2	Include
Geodesy	4-3	Omit
Bridges	10-0	Include
Higher Structures	6-3	Omit
Municipal Engineering	8-2	Include
Water Power Engineering	9-1	Include
Tunnels	7-3	Include
Rivers	6-2	Omit
Engineering Economics	4-3	Omit
City Planning	7-3	Include
Roofs	7-1	Include

Engineering Architecture	4-4	Omit
Water Supply	9-0	Include
Hydraulic Design	11-0	Include
Railway Engineering	10-0	Include
Harbors	4-3	Omit
Specifications	8-1	Include
Drainage	1-0	Omit
Physical Valuation	1-0	Omit
Refrigeration	1-0	Omit
Power Plants	1-0	Omit
Pumps and Hydraulic Machinery	1-0	Omit
Concrete Design and Control	1-0	Omit

Accordingly the Committee recommends that the scope of the specialized examination in *Civil Engineering* include: Advanced Surveying, Structural Engineering, Buildings, Highway Engineering, Sanitary Engineering, Design of Dams, Canals, Bridges, Municipal Engineering, Water Power Engineering, Tunnels, Roofs, City Planning, Water Supply, Hydraulic Design, Railway Engineering, Contracts, Specifications.

Mechanical Engineering

For the specialized examination in *Mechanical Engineering,* the following is a list of subjects considered, the vote on each, and the Committee's recommendation thereon:

Subject	Vote	Recommendation
Machine Design	9-0	Include
Steam Engines	9-0	Include
Compressors and Fans	7-2	Include
Power Plants	9-0	Include
Internal Combustion Engines	9-0	Include
Power Plant Engineering	9-0	Include
Boiler Design	9-0	Include
Steam Turbines	9-0	Include
Elevators	6-3	Include
Heating	8-0	Include
Pumps and Hydraulic Machinery	7-2	Include
Industrial Management	4-4	Omit
Steam Engineering	8-0	Include
Diesel Engines	6-3	Include
Machine Tools	4-4	Omit
Ventilation	7-1	Include
Industrial Plants	6-3	Include

Accordingly the Committee recommends that the scope of the specialized examination in *Mechanical Engineering* include: Machine Design, Steam Engines, Power Plants, Internal Combustion Engines, Power Plant Engineering, Boiler Design, Steam Turbines, Steam Engineering, Heating, Ventilation, Compressors and Fans, Pumps and Hydraulic Machinery, Diesel Engines, Elevators, Industrial Plants.

Electrical Engineering

For the specialized examination in *Electrical Engineering,* the following is a list of subjects considered, the vote on each, and the Committee's recommendation thereon:

Subject	Vote	Recommendation
Direct Current Systems	9-0	Include
Illuminating Engineering	9-0	Include
Transformers	8-1	Include
Distribution Systems	9-0	Include
Electrical Communication	7-1	Include
Electrical Machine Design	8-1	Include
Alternating Current Systems	9-0	Include
Motors	8-0	Include
Conversion Equipment	7-2	Include
Transmission Lines	9-0	Include
Radio Communication	4-4	Omit
Generators	9-0	Include
Power Stations	9-0	Include
Electric Railways	5-3	Omit
Wiring Codes	4-5	Omit

Accordingly the Committee recommends that the scope of the specialized examination in *Electrical Engineering* include: Direct Current Systems, Illuminating Engineering, Distribution Systems, Alternating Current Systems, Transmission Lines, Generators, Power Stations, Motors, Transformers, Electrical Machine Design, Electrical Communication, Conversion Equipment.

Mining Engineering

For the specialized examination in *Mining Engineering,* the following is a list of subjects considered, the vote on each, and the Committee's recommendation thereon:

Subject	Vote	Recommendation
Mine Surveying	7-1	Include
Assaying	7-1	Include
Excavation and Tunneling	7-0	Include
Hydrometallurgy	6-0	Include
Mine Administration and Accounts	5-2	Include
Economic and Dynamic Geology	5-2	Include
Prospecting	7-0	Include
Boring and Shaft Sinking	7-0	Include
Ore Dressing	7-0	Include
Mining Laws	6-1	Include
Petrology	6-1	Include
Development and Mining Methods	4-2	Omit
Design of Mine Plant	6-1	Include
Mill Design	6-1	Include
Reporting	1-0	Omit
Metallurgy	1-0	Omit

Accordingly the Commimttee recommends that the scope of the specialized examination in *Mining Engineering* include: Mine Surveying, Assaying, Excavation and Tunneling, Prospecting, Boring and Shaft Sinking, Ore Dressing, Hydrometallurgy, Mining Laws, Petrology, Economic and Dynamic Geology, Design of Mine Plant, Mill Design, Mine Administration and Accounts.

Chemical Engineering

For the specialized examination in *Chemical*

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Engineering, the following is a list of subjects considered, the vote on each, and the Committee's recommendation thereon:

Subject	Vote	Recommendation
Industrial Chemistry	8-0	Include
Factory Practice	5-2	Include
Quantitative Analysis	8-0	Include
Chemical Engineering Administration	4-2	Omit
Organic Chemistry	8-0	Include
Industrial Water Supply	6-1	Include
Physical Chemistry	6-1	Include
Applied Colloid Chemistry	5-1	Include
Industrial Electro-Chemistry	7-1	Include
Waste Disposal	7-1	Include
Chemical Process Development	7-0	Include
Chemical Plant Design	7-1	Include
Utilization of Wastes	1-0	Omit

Accordingly the Committee recommends that the scope of the specialized examination in *Chemical Engineering* include: Industrial Chemistry, Factory Practice, Quantitative Analysis, Organic Chemistry, Industrial Water Supply, Physical Chemistry, Applied Colloid Chemistry, Industrial Electro-Chemistry, Waste Disposal, Chemical Process Development, Chemical Plant Design.

Practical Suggestions

The Committee submits the following suggestions to guide those who prepare the examination papers for registering Professional Engineers:

1. In view of variations in training and experience of different candidates, the Committee recommends that each examination paper provide a reasonable range of selection of questions by the candidate. It is suggested that the candidate may be allowed to select 10 questions out of 15 on each paper.

2. In view of the fact that the examinations are taken years after graduation or completion of studies, the question papers cannot be made as difficult or exacting as regular college examinations. The questions should preferably be such *as can easily be answered by an engineer who has been out of college for 10 years.* They should cover such fundamental principles as it is practically impossible for a trained practicing engineer to forget.

3. The questions should preferably be such as can be answered quickly and directly. The candidates have lost the habit of college examinations, and everything should be done to relieve their state of mental strain in these professional examinations.

4. It is suggested that 3 hours be the official time allowance for each examination (10 questions to be answered out of 15), but that the questions be such that they can readily be answered in less than an hour by one who is not under the nervous strain of the candidates.

5. The questions should be so framed that the answers can be quickly and definitely marked and graded.

6. Questions that are involved or academic should be avoided. Very simple questions will suffice to detect whether the candidate is ignorant of the subject represented.

7. The nature of the questions will of course, be affected by the allowance or non-allowance of the use of reference books in the respective examination papers.

8. The use of the slide rule may be permitted in all examinations.

Summary of Recommendations

Based on the foregoing comparative study of present practice and prevailing preference in the matter of examinations for Professional Engineers, the Committee submits the following recommendations toward standardizing the examination requirements and procedure.

1. Written examinations should be maintained as a *standard requirement* for the registration of Professional Engineers, exemptions only in exceptional cases of obvious outstanding educational and professional qualifications.

2. Exemption of engineering graduates from the written examinations is not favored.

3. The major part of the written examinations (about three-fourths) should be uniform for all applicants, and the remaining minor part may be differentiated for the different major branches of engineering (Civil, Mechanical, Electrical, Mining and Chemical.)

4. Any further subdivision of these major branches of engineering into further specialties should not be recognized by differentiated examinations.

5. The written examinations for registering Professional Engineers should be scheduled to take at least *two days,* preferably three days.

6. Oral interviews may be provided, at the option of the Board, to supplement the written examinations in special cases, but the use of any oral technical examinations should be progressively minimized.

7. The major part, at least, of the written examinations should be planned to permit the use of reference books. The use of a slide rule may be permitted in all parts of the examinations.

8. The requirement of a thesis to be submitted as part of the written examination is recommended as a desirable feature but may, for the present, be left optional with the individual State Boards.

9. Certification of successful candidates should be as Professional Engineers (or preferably as Engineers) without classification or differentiation into branches or specialties. The examinations should be planned on this governing principle.

10. The written examination, to meet present requirements and educational standards, should test: (a) basic knowledge of the *fundamental mathematical and physical principles* underlying all engineering work; (b) general knowledge of the *common essentials of all branches of engineering;* (c) *more thorough general knowledge of one major branch of engineering.*

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11. Each examination paper should contain from 10 to 15 questions, from which the candidate is to select 10.

12. The official time allowance should be 3 hours for each paper, but the questions should be so framed as to permit completion in a fraction of the allotted time.

13. The questions should be simple and direct, and such as can easily be answered by an engineer who has been out of college for 10 years.

14. The recommended schedule and scope of the written examinations is as summarized below.

Recommended Schedule and Scope of Examinations

(Parts 1, 2, and 3 uniform for all engineers. Candidates to select one division in Part 4.)

First Morning—Part 1
Mathematics and Applied Sciences
For All Engineers

(Slide rule may be used, but no reference books. Answer 10 of 15 questions. Time, 3 hours.)

Mathematics: Algebra, Advanced Algebra, Logarithms, Plane Geometry, Solid Geometry, Trigonometry, Analytical Geometry, Calculus.

Applied Sciences: Physics, Mechanics, Statics, Dynamics, Hydraulics, Thermodynamics, Electricity, Electro-Magnetism, Chemistry.

First Afternoon—Part 2
Materials of Construction and Elements of Structural Design
For All Engineers

(Slide rule and reference books may be used. Answer 10 of 15 questions. Time, 3 hours.)

Materials of Construction: Resistance of materials, Steel, Reinforced Concrete, Masonry Construction, Timber Construction.

Elements of Structural Design: Stress Analysis, Graphic Statics, Beams, Slabs, Columns, Girders, Trusses, Foundations, Retaining Walls, Unit Stresses.

Second Morning—Part 3
Elements of Mechanical and Electrical Design and Engineering Administration
For All Engineers

(Slide rule and reference books may be used. Answer 10 of 15 questions. Time, 3 hours.)

Mechanical: Power, Heating, Ventilation, Prime Movers, Mechanical Transmissions.

Electrical: Laws of Electricity, Electrical Equipment, D. C. and A. C. Circuits, Types and Characteristics of Motors and Generators.

General: Engineering Economics, Contracts, Specifications, Professional Practice, Professional Ethics.

Second Afternoon—Part 4
Civil, Mechanical, Electrical, Mining, or Chemical Engineering
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(Slide rule and reference books may be used. Answer 10 of 15 questions. Time, 3 hours.)

(a) *Civil Engineering:* Advanced Surveying, Structural Engineering, Buildings, Highway Engineering, Sanitary Engineering, Design of Dams, Canals, Bridges, Municipal Engineering, Water Power Engineering, Tunnels, Roofs, City Planning, Water Supply, Hydraulic Design, Railway Engineering, Contracts, Specifications.

(b) *Mechanical Engineering:* Machine Design, Steam Engines, Power Plants, Internal Combustion Engines, Power Plant Engineering Boiler Design, Steam Turbines, Steam Engineering, Heating, Ventilation, Compressors and Fans, Pumps and Hydraulic Machinery, Diesel Engines, Elevators, Industrial Plants.

(c) *Electrical Engineering:* D. C. Systems, Illuminating Engineering, Distribution Systems, A. C. Systems, Transmission Lines, Generators, Power Stations, Motors, Transformers, Electrical Machine Design, Electrical Communication, Conversion Equipment.

(d) *Mining Engineering:* Mine Surveying, Assaying, Excavation and Tunneling, Prospecting, Boring and Shaft Sinking, Ore Dressing, Hydrometallurgy, Mining Laws, Petrology, Economic and Dynamic Geology, Design of Mine Plant, Mill Design, Mine Administration and Accounts.

(e) *Chemical Engineering:* Industrial Chemistry, Factory Practice, Quantitative Analysis, Organic Chemistry, Industrial Water Supply, Physical Chemistry, Applied Colloid Chemistry, Industrial Electro-Chemistry, Waste Disposal, Chemical Process Development, Chemical Plant Design.

Concluding Remarks

A profession is judged by its qualification standards. Without written examinations to test educational qualifications, Engineering cannot take its rightful place among the learned professions.

To justify the breadth of scope of practice claimed for our profession, the qualifying examinations must be broad in scope. The range of subjects included in the examination will be compared with the range of practice claimed by the profession.

To the extent that Engineering is essentially a mode of thought based on a mastery of the laws of Nature, the examinations should be basic and fundamental rather than specialized. To the extent that the greater part of engineering training is common to all engineers, without regard to branch or specialty, the greater part of the examination should be uniform for all candidates.

The essential purpose of the examination should be to test and qualify the candidate as an Engineer, not as a specialist.

Respectfully submitted,
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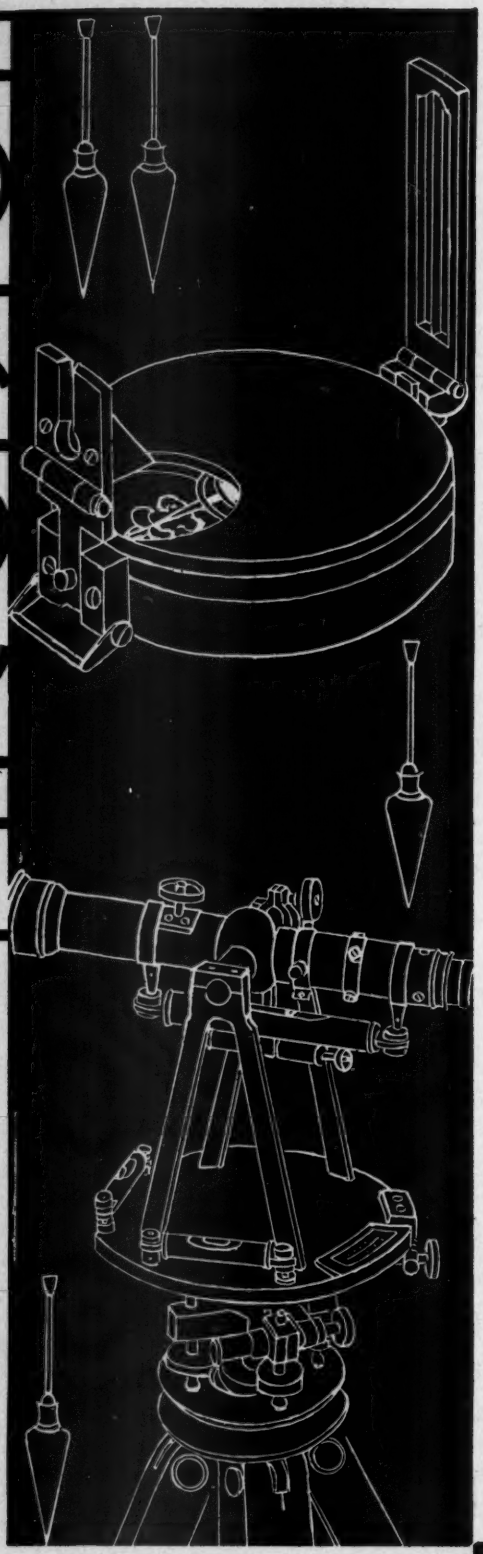

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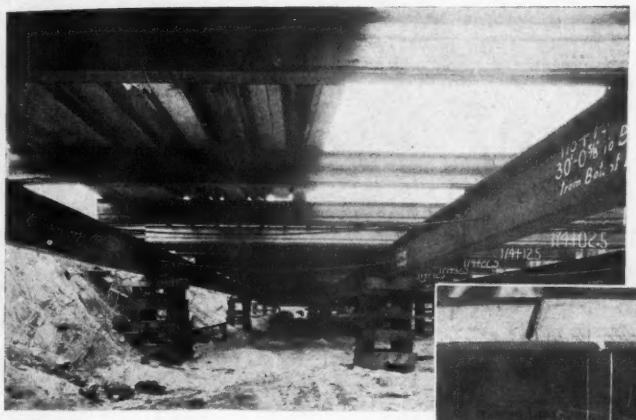

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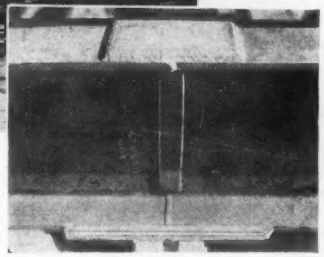

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